



GROUND LOOPS IN THE AV WORLD

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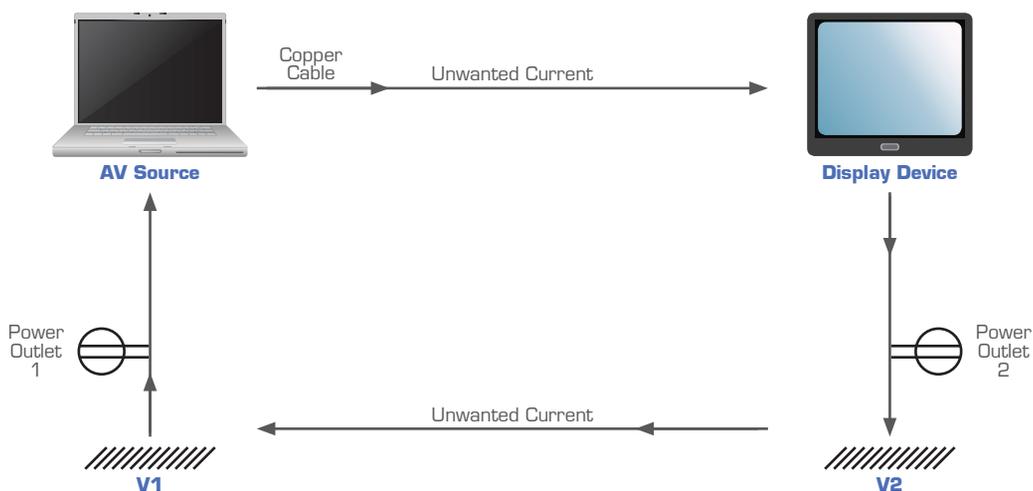
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Ground Loops in the AV World?

There's no such thing, right? Wrong. Ground loops are a leading cause of equipment failures and signal complications in the AV world. A ground loop is created when a current (either AC or DC) connects the grounds of two devices that should have the same ground potential but are different. This current can cause symptoms that can vary anywhere from signal noise, to a floating "video hum bar," to an audio "buzz," to a total equipment failure, and even electric shock. There are many cases in which integrated circuits or printed circuit boards inside affected devices are visibly damaged or burned due to ground loops.

As seen in the example below, many systems – simple or complicated can utilize multiple different ground potentials. This is a common occurrence because the AV source and the display device are quite often in two different locations, and thus using different electrical outlets. The problem occurs when the ground potential of $V1$ is different than the ground potential of $V2$. When the AV source and the display device are connected together with a copper or aluminum cable, the two different ground potentials create a ground loop using the shield of the cable. This cable could be a video cable, audio cable, or any other type of metallic conductor cable.

Example 1:



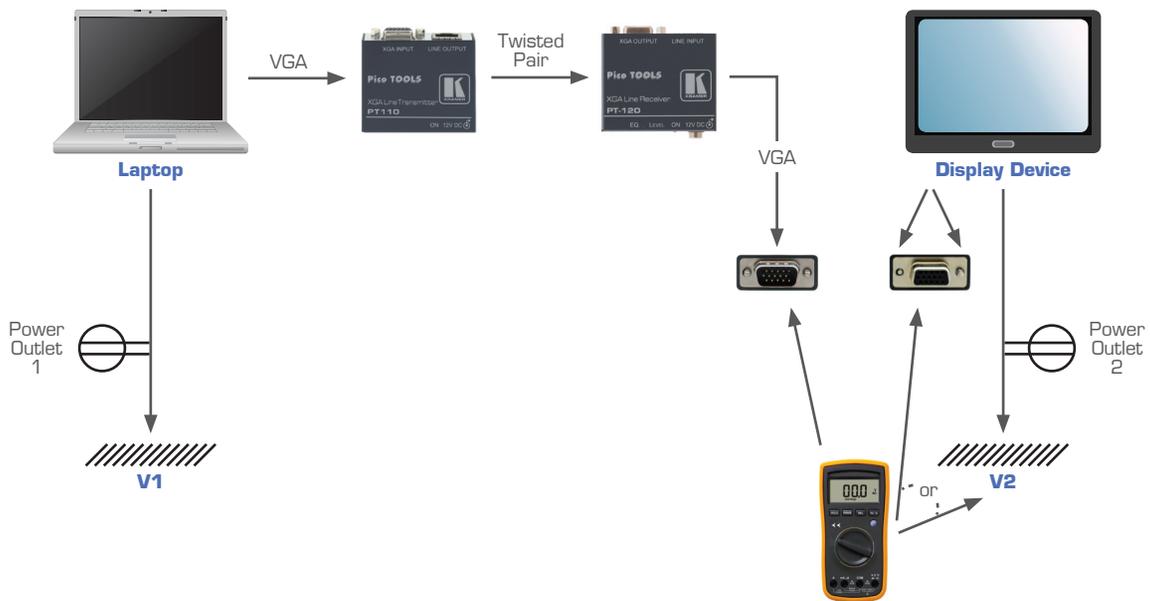
The shield of the connection cables are generally connected to the chassis of the device which is an unprotected surface, introducing the risk of electric shock to the user and damage to the equipment.

Testing for and Solving Ground Loops

Systems can and should be tested for ground loops before connecting the two sides of the system with the copper or aluminum cable. This is done by using a multi-meter or volt-meter. For example, when setting up the system above, place one probe from the multi-meter on the shield of the copper or aluminum cable that is connected to the AV source before the cable is connected to the display device. Place the other probe on the ground that is connected to Power Outlet 2. Test for both AC and DC voltage. If there is any voltage greater than one volt, consult with a licensed electrician. NEVER use a three prong to two prong adapter, also known as a “Ground Lifter” to solve a ground loop problem in a system. Doing this will remove the ground from the device, thus increasing the risk of electric shock. The ground on electrical devices is intended as a safety feature to protect the users and the devices.

When using a twisted pair transmitter and receiver system in an AV application test for ground loops in the same way as above, being sure to test the shield of the cable that will connect the twisted pair receiver to the display device.

Example 2:



Other Ways to Prevent and Solve Ground Loops

One way to prevent ground loops is to transport the video and audio signals over fiber optic transmitter and receiver systems. Fiber optic solutions prevent ground loops by avoiding the use of any metallic conductors. As previously discussed, the metallic conductor in AV cables is the glue that ties the system devices together, enabling ground loops.

There are devices on the market designed to remove or isolate ground loops in video and audio systems. These devices are known as Ground Loop Isolators, or GLIs. They safely isolate the current that is traveling on the ground of the devices in the system. Keep in mind that GLIs can normally handle 3-4 volts. Any voltage beyond the specification of the GLI will damage the unit, and render it useless.

Conclusion

Ground loop issues are one of the largest contributors to AV system complications. They can severely damage equipment, injure the user, or cause signal noise and degradation. Most manufacturers' warranties do not cover damage to products due to ground loops.

Every system should be tested thoroughly for ground loop current or voltage before connecting devices. If you are not sure if there is a ground loop in the system, consult a licensed electrician.



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